

# JOINT GLOBAL POSITIONING SYSTEM COMBAT EFFECTIVENESS (JGPSCE)



## Joint Test and Evaluation Program

Authorized Manning:	42
Total JT&E Budget:	\$30M
Charter Date:	4QFY99
Completion Date:	2QFY04

## Lead Service

Air Force

## JT&E DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

The Joint Global Positioning System Combat Effectiveness (JGPSCE) Joint Test Force is chartered to evaluate the impact of electronic warfare targeted against global positioning system (GPS) receivers in joint operations. GPS provides highly accurate, real time, passive, common-reference grid position and time information to military and civilian users worldwide. GPS enables the military forces to determine their position, velocity, and time. GPS will: (1) enhance command and control and coordinate battle tactics and support; (2) engage in strategic and tactical warfare; (3) maneuver efficiently on the battlefield; (4) provide accurate and timely fire support; and (5) facilitate combat service support operations. In addition, knowledge of the exact position and time is essential to reconnaissance and intelligence missions. GPS provides the precision, velocity, and time elements of *information superiority*, and serves as the cornerstone of the warfighter's ability to execute the *Joint Vision 2020* concept of *precision engagement*.

## **BACKGROUND INFORMATION**

JGPSCE's Problem Statement:

*“Warfighters are increasingly reliant on GPS. The impact of the loss or degradation of GPS capabilities, and the ability to operate despite that loss or degradation, has not been systematically tested or evaluated in a joint operational environment.”*

In July 1999, the Office of the Under Secretary of Defense, Director, Test, Systems Engineering and Evaluation, chartered the JGPSCE joint test and evaluation (JT&E) to address three issues:

- What is the impact of GPS vulnerabilities on the effectiveness of joint operational missions requiring precision engagement?
- What changes in joint tactics, techniques, and procedures or system-level mitigation techniques improve or maintain joint operational effectiveness in the event of GPS electronic warfare and electromagnetic interference?
- What test methodologies can be employed to characterize GPS vulnerabilities in future acquisition and integration programs?

## **TEST & EVALUATION ACTIVITY**

JGPSCE JT&E will conduct three phases of testing, implemented by four tests events, each examining an increasing level of warfare. The three phases of warfare are: (1) Small Scale Contingency; (2) Limited Engagement; and (3) Major Theater War. Each level represents a major concern for DoD planners today, as well as presents unique problems in maneuver, engagement, and logistics/force protection. All are highly dependent on secure, high-speed communications.

In order to provide a manageable scope of testing, JT&E is limiting the evaluation to the arena of precision engagement of interdiction targets. This decision was taken for several reasons. First of all, there are other JT&E activities looking at time critical targets (Joint Suppression of Enemy Air Defenses and Joint Warfighter), logistics (Joint Theater Distribution), and force protection (Joint Combat Search and Rescue). Second, the operational concept of precision engagement can be embodied in the two joint tasks of reconnaissance and interdiction, giving JGPSCE a sound doctrinal base. Finally, precision engagement can be applied to reconnaissance and interdiction exercises in a complete sensor-to-shooter chain, crossing the boundaries of both the Joint Targeting Cycle at the operational level and Tactical Mission Functions at the tactical level.

Each of the three test phases is designed to provide information relating to key information upon which warfighters can base subsequent decisions. Each phase will use jamming of GPS in the open air to be as realistic as possible. Each phase will look at the impact of GPS electronic warfare and electromagnetic interference by comparing baseline performance to performance after the electronic warfare and electromagnetic interference occurs. Each phase will also introduce mitigation techniques and procedures developed during test planning, and look at the ability of troops and commanders to operate in a GPS degraded or denied environment. Thus, each of the three phases will be immediately useful to theater commanders and DoD.

*Phase 1* testing consists of two live test events, GYPSY ALPHA and GYPSY BRAVO, at the tactical level of warfare. These tests focus on determining GPS electronic warfare and electromagnetic interference vulnerabilities and mitigations for few-on-few engagements during small-scale contingencies. Each of the two live tests in Phase 1 will concentrate on portions of the sensor-to-shooter architecture.

*Phase 2* testing will consist of one live test event, GYPSY CHARLIE. The focus of this test will be on integrated system-of-systems tactical-level mission performance and integrated system-of-systems operational-level mission performance during limited engagement operations.

*Phase 3* testing will consist of a single test, GYPSY DELTA, which will evaluate integrated tactical and operational level systems and warfighters performing missions during a major theater of war scenario.

GYPSY ALPHA testing began with trial 1 on October 30, 2000, and will continue through November 18.

## **TEST & EVALUATION ASSESSMENT**

The JGPSCE Joint Test Force is expected to help theater commanders in four ways:

- First, the impact of degrading or denying GPS will be evaluated. This should settle a lot of controversy over the effects of GPS signal loss or degradation and provide a badly needed baseline for future planning and acquisitions.
- Second, there is a great deal of anecdotal evidence which suggests that existing equipment can be used more effectively to minimize the effects of electronic warfare targeted against GPS. This JT&E should help institutionalize better training and awareness in the field.
- Third, commanders and soldiers will learn the leading indicators of GPS electronic warfare or electromagnetic interference, and differentiate between them, making operational and tactical responses quickly and with greater confidence than possible today.
- Finally, this JT&E should result in a greater appreciation of the need to fully understand GPS capabilities, dependencies, and vulnerabilities in establishing system requirements, finalizing designs, developing concepts of operations, and executing realistic tests. The outcome should be new systems that use GPS more effectively and appropriately. Once fielded, system operators should better understand the role of GPS in their equipment, incorporate signal protection into their design and use, and immediately recognize whether GPS is being degraded or denied.

## **CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED**

Assessing the vulnerability of GPS-based systems to the effects of electronic warfare, and determining appropriate actions to prevent or negate those effects, is one of the most important tasks confronting DoD. It is imperative that the Department makes every effort to ensure the successful

conduct of JGPSCE, as well as ensure that the lessons learned are incorporated into current and future systems.